sides permits Dylux® products to be used in single- and two-sided proofing products for the graphic arts industry. Two-sided papers require a substrate with sufficient ultraviolet light opacity so that image formation is restricted to one side at a time.

Performance improvements reported by Dessauer (1981, 1982) and Sheets (1986) were derived primarily from changes in photoinitiators, where, as a result of detailed synthetic and spectroscopic studies, more effective separation of the absorption maxima in the ultraviolet and visible was achieved. The utilization of certain highly substituted biimidazoles has also given rise to more stable free radicals, which can partake in more effective color formation, rather than rapid reversal or non-color-forming side reactions.

Dylux® products are designed to form stable images as a result of a secondary light exposure. Images formed by photooxidation of leuco dyes can also be stabilized by several other routes, e.g., wet treatments with reducing agents such as Phenidone (Dessauer and Firmani, 1981). Manos (1968) stabilized images by thermal generation of a radical trap. Photolysis of diazonium salts in the presence of moisture was described by Cescon (1968). A higher speed system, in which mobility of ingredients was reduced as a result of a photopolymerization reaction was reported by Cescon et al. (1971a) and Dessauer and Looney (1979). Image formation, which is a diffusion reaction, is also controllable by suitable choice of matrix elements; Looney (1971) showed that certain resins which can be thermally softened will permit color formation if the photolysis and heat treatment are carried out within a relatively short time interval.

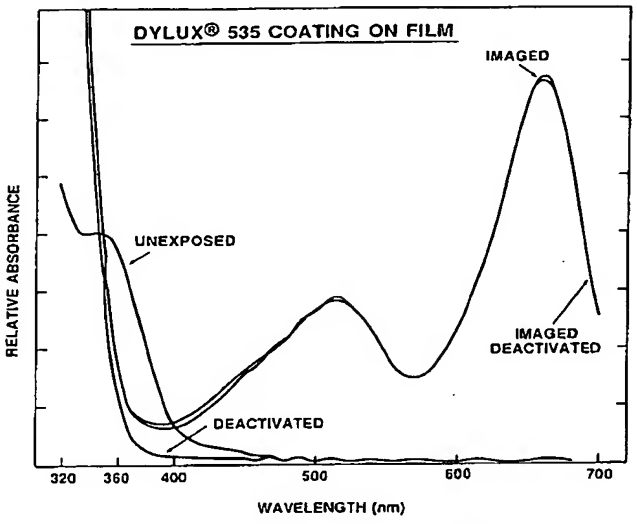


Fig. 8-1. Absorption spectra of a typical Dylux® film: unexposed; after exposure to ultraviolet light; after deactivation with visible light.

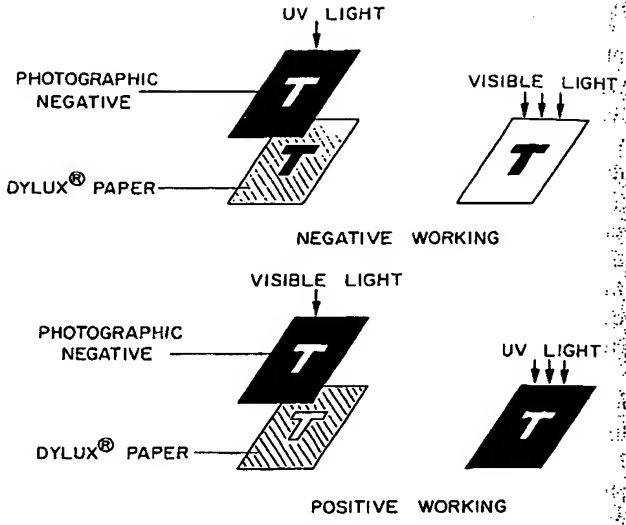


Fig. 8-2. Dual response of Dylux® material. (*Top*) Negative image formation by imagewise exposure to ultraviolet light. (*Bottom*) Positive image formation with initial imagewise exposure to visible light followed by flooding exposure with ultraviolet light.

**Stabilization of Leuco Dyes.** Streeper (1978) described a system in which oxygen-sensitizing compounds, subsequent to exposure with visible light in the 400–700 nm range, stabilize leuco dyes. Biimidazoles, triarylmethane leuco dyes and certain polycyclic quinones are employed, and image formation results from a two-exposure system, in which the imagewise exposure is made with visible light and the image is developed by a subsequent ultraviolet exposure.

**Photothermal Systems.** A number of photothermal systems are described in the literature. Uji-Ie (1982) describes a light- and heat-sensitive system containing a photooxidant, i.e., a biimidazole derivative, a leuco dye, a cobalt(III) complex, a photoreductant, a hydrogen donor, and a dioxime-type chelating compound, where the acid formed promotes color generation, and the cobalt derivative generates amines on heating.

## DIAZO PRODUCTS

Among the largest volume imaging materials are diazo films and papers. This is due to the maturity of the field, excellent reproducibility of the diazo process, and relatively low cost. To illustrate the size of the industry, more than 86,000 tons of diazo-type paper were produced in 1969.

Diazo technology was first described by Green, Cross, and Bevan in Great Britain in 1890, but successful commercial products were not marketed until 1923, when

# IMAGING PROCESSES AND MATERIALS

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Edited by

**John Sturge**
**Vivian Walworth**
**Allan Shepp**



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